Odontogenic Cysts of upper jaw an analysis

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Abstract

This article attempts to analyze all cases of odontogenic cysts involving upper jaw who presented at Stanley Medical college during 2007 – 2012. This article analyzes the incidence of these cysts during the above said period, age of occurence, sex prediliction if any, clinical presentations and optimal treatment modality. Common complaints with which patients presented to our Institution was swelling over jaw, next was loosening of dentition, paresthesia. 30 patients had presented with cysts involving upper jaw out of which 29 were females and one was male. All these patients underwent surgical removal of the cystic lesion.

Definition:

Odontogenic cysts are defined as epithelial cell lined cysts. This lining is derived from the odontogenic epithelium. Most of these odontogenic cysts are defined by their position than by their histology. It is important hence to describe even the site of lesion while sending the surgical specimen to a pathologist.

Introduction:

International Classification of Diseases (ICD 10) classifies odontogenic cysts involving upper jaw

into:

1. Radicular cysts
2. Dentigerous cysts
3. Primordial cyst
4. Lateral periodontal cyst
5. Residual cyst
6. Odontogenic keratocyst
7. Calcifying odontogenic cyst (Gorlin cyst)
8. Globulomaxillary cyst
9. Eruption cyst

These cysts are the most common cystic lesions involving maxillofacial area[1] . Cystic lesions are common in the jaw bones than anywhere else in the body because of the presence of epithelial cell

rests which are commonly left behind following odontogenesis

Radicular cysts:

Synonyms – Periapical cyst, dental cyst

This is the commonest of all odontogenic cysts[2] . These cysts could also be considered as an inflammatory cyst originating from Malassez's cell rests[3] . These cysts are caused by root infections involving roots of teeth closely related to maxillary sinus antrum. Infections / inflammation releases toxins at the apex of the tooth leading on to periapical inflammation. They stimulate the Malassez's cell rests which can be found in the periodontal ligament resulting in periapical granuloma which could either be infected or sterile. These cysts could well be sterile if the patient had received antibiotic therapy for dental infections. Radiological differentiation between granuloma and cyst could prove to be rather difficult. The general rule of the thumb being if the lesion is large in radiological imaging then it should be considered as cyst. These cysts increase in size at the expense of the surrounding bony barrier. This expansion is caused by pressure effects and effects of inflammatory enzymes over the surrounding bone. These cysts are lined by stratified squamous epithelium without kerain formation. Evidence of inflammation can be seen along the cyst wall.

Pathophysiology of Radicular cysts:

1. Inflammatory mediators / enzymes
2. Bacterial toxins

These two factors have been implicated as the probable factors contributing to Radicular cysts. Among these two Bacterial toxins play a rather vital role. Bacterial endotoxins have been found in large amounts in and around necrotic tooth. These toxins have been shown to be mitogenic[4] . These endotoxins also stimulate expression of cytokines and chemokines[5] . Inflammatory mediators and proinflammatory cytokines released by the host tissue are known to modulate the biochemical activity of epidermal growth factor (EGF) there by causing increased proliferation of cellular elements. They also stimulate local fibroblasts into hyperactivity by expressing Keratinocyte growth factor. The epithelial cell rests of Malassez are usually quiescent / stable cells. These cells are in the G0 phase[7] of their cell cycle. These cells need to be exposed to extracellular signals to push them into the cell cycle proper. These extracellular signals are collectively known as Mitogen. Experimentally a cell can be identified to be in the proliferative phase by their ability to express markers like PCNA and Ki-67. Ki-67 marker is present in cells belonging to all phases of cell division except G0 phase. Studies reveal increased levels of PCNA and Ki-67 markers in the

epithelial lining of radicular cysts [8] .

The actual binding of Mitogen (growth factor) to receptors present on the cell membrane surface initiates a series of intracellular reactions pushing the cell into mitotic phase.

Probable growth factors (Mitogen) involved in the pathogenesis of radicular cysts include:

1. EFG & KGF – released by stromal fibroblast
2. TGF-α – released by macrophages and lymphocytes
3. IGF (Insulin like growth factor) – released by stromal fibroblasts

In the pathophysiology of formation of radicular cysts mediators released by inflammatory cells (macrophages and lymphocyts) play a vital role [9] .

Enlargement of radicular cyst:

This invariably occurs at a rather slow pace. Various factors influence the rate of expansion. These factors include:

1. Mural growth
2. Hydrostatic enlargement
3. Bone resorbing factor [10]

Rapid expansion of radicular cyst is associated with increase in hydrostatic pressure within the cyst. The hydrostatic pressure within the cyst is higher than that of capillary pressure, causing fluid to enter from the capillaries into the cyst cavity. This high hydrostatic pressure within the cyst has been attributed due to the amount of high molecular weight protein present in the cyst fluid. This protein is released by inflammatory cells in response to inflammatory stimulus.

Role played by mast cells in radicular cyst enlargement:

Mast cells play a significant role in radicular cyst enlargement [11] . Studies reveal that there are increased number of mast cells in the subepithelial zone of these cysts. Mast cells contribute to increase in the size of these cysts in the following manner:

1. By directly releasing heparin into the lumen
2. By releasing hydrolyic enzymes
3. By releasing histamine which causes transudation of serum proteins [11]

Bone resorption by radicular cysts:

Radicular cysts causes resorption of alveolar process of maxilla. Osteoclasts have been known to cause this bone resorption. Osteoclasts need to be activated before it can reabsorb bone matrix.

Osteoclasts can be activated by:

RANKL

This reaction can be blocked by:

Osteoprotegerin (OPG)

RANKL is the molecule which activates osteoclasts by binding to its receptor RANK which is expressed on the surface of osteoclast precursor cells, where as OPG blocks this very reaction preventing activation of osteoclasts.

Inflammatory mediators like cytokines and Interleukins stimulate prolilferation of osteoclasts.

In response to inflammation host cells are known to produce Matrix Metallo Proteinase (MMP).

This molecule is capable of degrading extracellular matrix like collagen, fibronectin and proteoglycans. Endotoxins released by bacteria also stimualtes release of MMP. This substance helps osteoclasts in the bone resorption process.

Clinical features:

As the cyst expands it causes erosion of the floor of the maxillary sinus. As soon as it enters the maxillary antrum the expansion starts to occur a little faster because there is space available for expansion. When it reaches a size wherein it fills up the whole antrum, it can erode the anterior wall of the maxilla (in the canine fossa area). This is the weakest portion of the maxillay bone. When iterodes the anterior wall of the maxilla it could cause expansion of the maxilla which could be seen as a swelling in the cheek area. On palpation egg shell crackling may be felt in the anterior wall of the maxilla over the canine fossa. There will be associated tenderness.

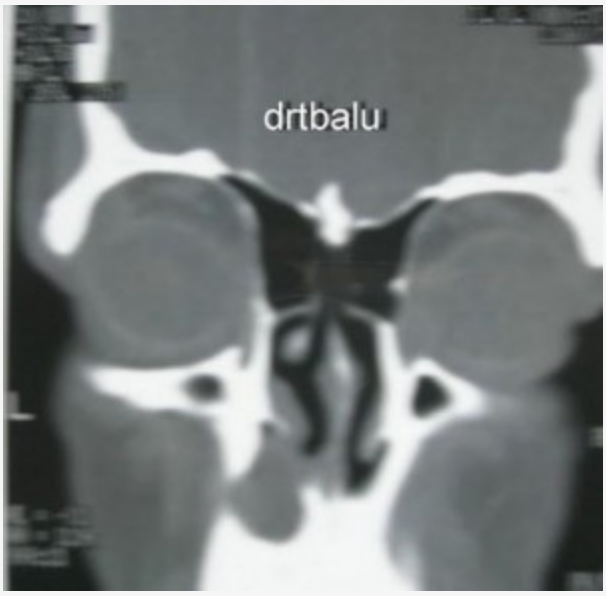
Tapping the teeth with a tongue depressor will cause tingling sensation because of involvement of the root of the teeth.

Management:

If the cyst is small, then it may resolve with endodontic therapy of the involved tooth. If the cyst is large then it will have to excised / marsupialised through Caldwell Luc approach. With the advent of nasal endoscopy, the lesion could be accessed using a nasal endoscope. The excised specimen should be sent for histopathological examination because squamous cell carcinoma could be lurking within the cystic lesion.

Clinical photo of a patient with radicular cyst

Clinical photograph showing radicular cyst maxilla being exposed via sublabial incision



Coronal CT of nose and sinuses showing radicular cyst of upper jaw

CT scan axial cut of nose and sinuses showing globulomaxillary cyst

CT scan showing dentigerous cyst with unerupted teeth

CT scan showing dentigerous cyst with unerupted teeth

Picture showing unerupted tooth within dentigerous cyst

Clinical photograph of a patient with dental cyst

Dentigerous cyst:

Also known as follicular cyst. This cyst is associated with unerupted tooth. This cyst is formed due to accumulation of fluid between the enamel epithelium and the completely formed tooth crown. This overlying cyst prevents teeth from erupting. This cyst is almost always associated with permanent dentition. In the upper jaw it is common in the canine tooth area. This cyst has its highest incidence during the 2nd and 3rd decades of life.

Radiologically the presence of pericoronal radiolucency is a diagnostic pointer. This tumor should be differentiated from ameloblastoma, odontogenic keratocyst and calcifying odontogenic cyst. All these lesions manifest with pericoronal radiolucency in routine radiographs.

Primordial cyst:

This cyst arises due to cystic changes that occur in a developing tooth bud before the actual formation of enamel and dentin matrix. Since this cyst arises from developing tooth bud the tooth would be missing from the dental arch, or if teeth are all present then the presence of suprenumerary teeth should be suspected.

Lateral periodontal cyst:

This cyst develops from the periodontal ligament close to the lateral surface of erupted / unerupted teeth. This cyst is asymptomatic. The involved teeth is vital.

Residual cyst:

This cyst arises from remnants of epithelial cell rests left behind after extraction. This can also occur when a radicular cyst at the apex of the teeth is extracted. This cyst is commonly seen in the elderly.

Odontogenic keratocyst:

This cyst has a keratinized epithelial lining. Major draw back of this condition is its propensity to recur even after

complete removal. This cyst can mimic any of the cysts described above. It needs to be identified radiologically and pathologically. This cyst is seen between wide age groups.

Calcifying odontogenic cyst (Gorlin's cyst):

This is a very rare slow growing benign tumor like cyst. This condition manifests the features of solid mass while displaying features of tumor and cystic lesion. This cyst has equal incidence in both maxilla and mandible.

Globulomaxillary cyst:

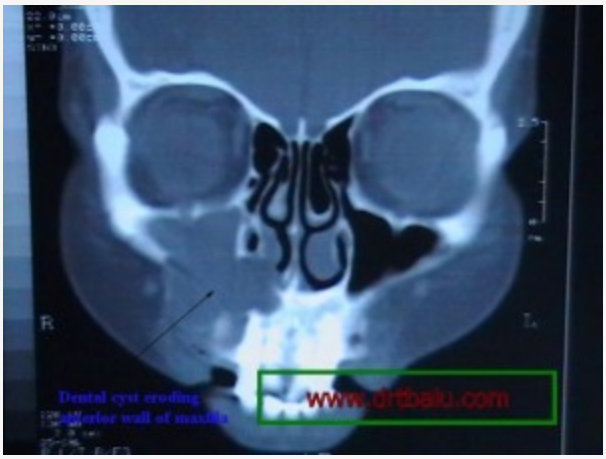
This is actually a fissural cyst arising from epithelial inclusions trapped at the line of fusion between the globular portion of the median nasal process and the maxillary process. Pathologists consider this cyst to be odontogenic rather than developmental. Radiographs show these cysts as pear shaped / circular shaped between the roots of maxillary lateral incisor and canine. Both these teeth are vital in these patients.

Gingival cysts:

are of two types i.e. adult and new born. In newborn these cysts are multiple, but rarely may also be single. They are located in the alveolar ridges. In children these cysts originate from the dental lamina. They are asymptomatic and donot cause any problems. In adults these cysts are commonly found in the lower premolar area. It is usually single.

Eruption cyst:

Also known as eruption hematoma. This occurs when the erupting tooth bursts through the bone, but is yet to penetrate the overlying gingiva. Bleeding into the cyst lumen may cause discoloration giving an impression of hematoma. These cysts rupture as soon as the tooth completes eruption, hence need not be treated.



Coronal CT scan of nose and sinuses showing dental cyst right maxilla

Picture showing the site of lesion exposed prior to surgery

Figure showing Caldwel Luc procedure completed via canine fossa

Inferior meatal antrostomy being performed to facilitate drainage

Management:

Majority of odontogenic cysts can be removed surgically using sublabial incision and reaching the interior of maxillary sinus via canine fossa (Caldwel Luc procedure). It should be borne in mind that the canine fossa is the thinnest part of the maxilla and can easily be breached.

After removal of the cyst via caldwel luc procedure it is mandatory to perform inferior meatal antrostomy to facilitate drainage of maxillary sinus because its mucociliary clearance mechanism is inadequate / reduced following surgery.

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